

What is claimed is:

1. An air conditioner for a vehicle having an engine for running the vehicle, the air conditioner comprising:

a refrigerant cycle including

a variable displacement compressor, driven at least by the engine, for compressing refrigerant, the compressor being capable of adjusting its displacement from an outside, and

an evaporator for cooling air to be blown into a passenger compartment of the vehicle by performing a heat exchange between the air and low-pressure low-temperature refrigerant in the refrigerant cycle supplied by the compressor; and

an air-conditioning control unit for controlling the displacement of the compressor based on a cooling load in the passenger compartment, wherein:

the air-conditioning control unit outputs an engine drive signal for requiring a drive of the engine, and the compressor is driven by the engine, when the cooling load is larger than a predetermined value;

the air-conditioning control unit prohibits an output of the engine drive signal when the cooling load is equal to or smaller than the predetermined value; and

when the cooling load is larger than the predetermined value, the air-conditioning control unit controls the displacement of the compressor at a control value larger than a value controlled based on the cooling load, at least for a predetermined time.

2. The air conditioner according to claim 1, wherein the

air-conditioning control unit controls the displacement of the compressor at the control value larger than the value controlled based on the cooling load, immediately after the cooling load becomes larger than the predetermined value.

3. The air conditioner according to claim 1, wherein the air-conditioning control unit controls the displacement of the compressor at the control value larger than the value controlled based on the cooling load, until the cooling load becomes lower than the predetermined value.

4. The air conditioner according to claim 1, wherein the control value larger than the value controlled based on the cooling load is a maximum displacement of the compressor.

5. The air conditioner according to claim 1, wherein the air-conditioning control unit calculates the cooling load based on at least a deviation between an actual temperature of the evaporator and a target temperature of the evaporator.

6. The air conditioner according to claim 1, wherein the air-conditioning control unit calculates the cooling load based on at least a deviation between an actual temperature of air immediately after passing through the evaporator and a target temperature of air immediately after passing through the evaporator.

7. The air conditioner according to claim 1, wherein:

when the cooling load is equal to or smaller than the predetermined value while it is determined that the engine is stopped, the air-conditioning control unit prohibits the output of the engine drive signal.

8. The air conditioner according to claim 7, wherein:

when the cooling load is equal to or smaller than the predetermined value while it is determined that the engine is operated, the compressor is operated by the engine.

9. The air conditioner, according to claim 1, wherein:

when the cooling load is equal to or smaller than the predetermined value while it is determined that the engine is stopped, the compressor is operated by an electric motor.

10. An air conditioner for a vehicle having an engine for running the vehicle, the air conditioner comprising:

a refrigerant cycle including

a variable displacement compressor, driven by at least one of the engine and an electric motor, for compressing refrigerant, the compressor being capable of adjusting its displacement from an outside, and

an evaporator for cooling air to be blown into a passenger compartment of the vehicle by performing a heat exchange between the air and low-pressure low-temperature refrigerant in the refrigerant cycle supplied by the compressor; and

an air-conditioning control unit for controlling the displacement of the compressor based on a cooling load in the passenger compartment, wherein:

the air-conditioning control unit outputs an engine drive signal for requiring a drive of the engine, and the compressor is driven by the engine, when the cooling load is larger than a predetermined value;

the air-conditioning control unit prohibits an output the engine drive signal while outputting a motor drive signal for requiring a drive of the electric motor, and the compressor is driven by the electric motor, when the cooling load is equal to or smaller than the predetermined value; and

when the cooling load is larger than the predetermined value, the air-conditioning control unit controls the displacement of the compressor at a control value larger than a value controlled based on the cooling load, at least for a predetermined time.

11. The air conditioner according to claim 10, wherein the air-conditioning control unit controls the displacement of the compressor at the control value larger than the value controlled based on the cooling load, immediately after the cooling load becomes larger than the predetermined value.

12. The air conditioner according to claim 10, wherein the air-conditioning control unit controls the displacement of the compressor at the control value larger than the value controlled based on the cooling load, until the cooling load becomes lower

than the predetermined value.

13. The air conditioner according to claim 10, wherein the control value larger than the value controlled based on the cooling load is a maximum displacement of the compressor.

14. The air conditioner according to claim 10, wherein the air-conditioning control unit calculates the cooling load based on at least a deviation between an actual temperature of the evaporator and a target temperature of the evaporator.

15. The air conditioner according to claim 10, wherein the air-conditioning control unit calculates the cooling load based on at least a deviation between an actual temperature of air immediately after passing through the evaporator and a target temperature of air immediately after passing through the evaporator.

16. The air conditioner according to claim 10, wherein:  
when the cooling load is equal to or smaller than the predetermined value while it is determined that the engine is stopped, the compressor is operated by the electric motor.

17. The air conditioner according to claim 16, wherein:  
when the cooling load is equal to or smaller than the predetermined value while it is determined that the engine is operated, the compressor is operated at least by the engine.

18. The air conditioner according to claim 10, wherein:

when the cooling load is smaller than a set value smaller than the predetermined value while it is determined that the engine is stopped, the air-conditioning control unit prohibits an output of the motor drive signal to the electric motor, and operation of the compressor is stopped.